

## Test bench for Circuit breaker testing

Measurement of the thermal and magnetic  
tripping characteristic of circuit breakers  
AC and DC types

*The relating standards:*

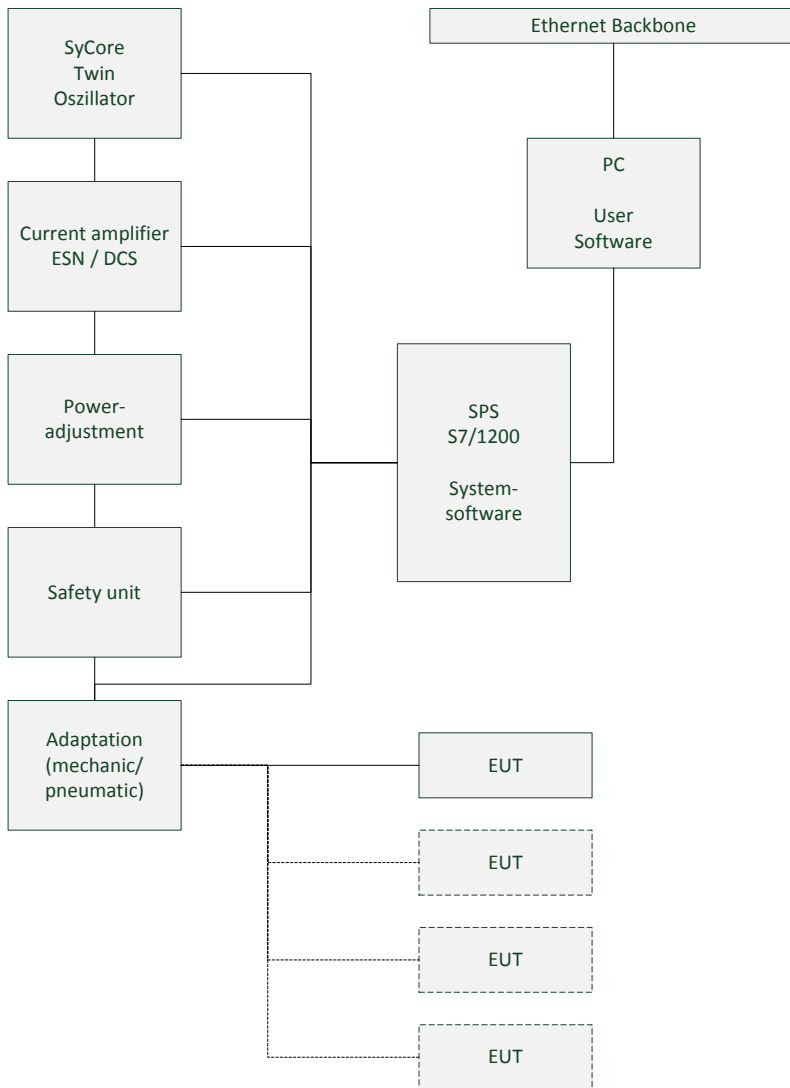
EN60947-1  
VDE0660-100  
EN60898-2



*Test bench for DC circuit breakers*

The test bench is available as 100% turnkey solution for AC circuit breakers as well as for DC circuit breakers.

## THE FUNCTIONAL PRINCIPLE:



### *Main components of the circuit breaker test system:*

- Signal generator **SyCore**
- Current amplifier **ESN or DCS**
- Power adjustment **IT** including range switching
- Supervising- and protection unit
- Adaptational units
- System control unit **SPS/S7/1200**
- Operator-PC with software

## OPTIONS AND ADD-ONS:

- Multi-channel adaptation – reduction of machine setup time
- redundant safety system with keylock and password protection including signalling lights for advanced personal safety
- Additional database software connector for centralized data storage



## CURRENT AMPLIFIER ESN SERIES (thermal and magnetic testing):

The ESN series current amplifiers have a very low harmonic distortion (typically <0.5%) and frequency ranges 45Hz-65Hz / 15Hz-150Hz / 45Hz-450Hz /DC. The specified continuous power relates to the requirements of the thermal testing. The available short-time power capability (for the magnetic tripping characteristic testing) is 3-times the continuous power of the ESN series. As an option the short-time power capability can be extended to 6.5 times of the amplifiers continuous power.

The ESN amplifier series has various continuous power ranges:

- 100VA	- 700VA	- 4500VA	- 9000VA
- 200VA	- 1000VA	- 5000VA	- 15000VA
- 400VA	- 1500VA	- 6000VA	- 30000VA
- 500VA	- 3000VA	- 7500VA	

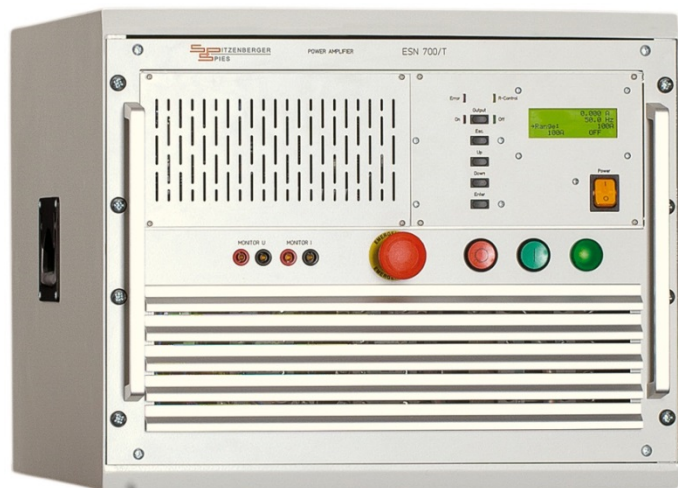
Possible current-/voltage combinations

### ESN 1500:

5A/600V  
20A/160V  
80A/40V  
260A/12V  
650A/9V  
1300A/4.5V

### ESN 4500:

5A/500V  
25A/150V  
50A/75V  
100A/37V  
300A/37V  
500A/22V  
1000A/22V  
1600A/14V



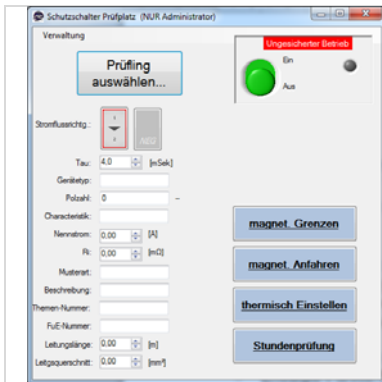
## CURRENT AMPLIFIER DCS SERIES (thermal testing):

The DCS series offers modular 5000VA power stages, optional parallel connection is available.

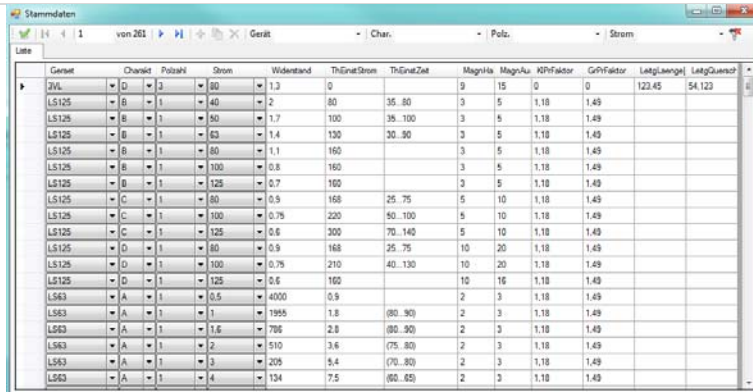
A power adjustment unit is available for both amplifier series.



## TEST AND EVALUATION SOFTWARE:



Selection of test types

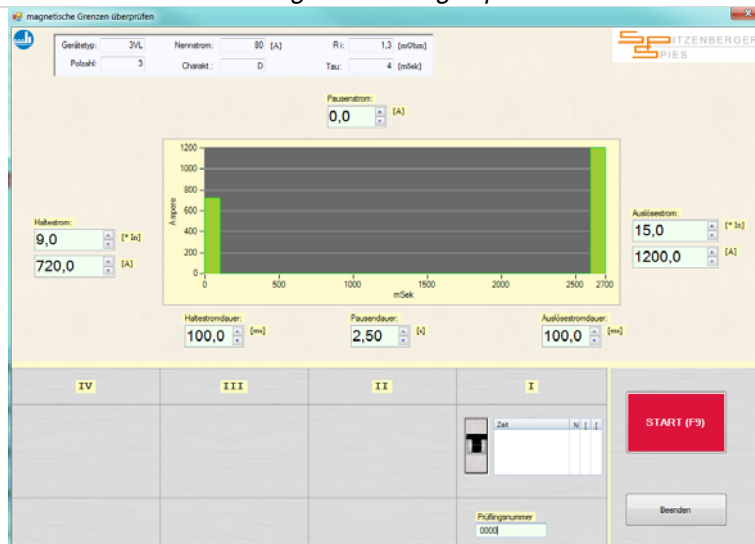


Gerat	Charakter	Polzahl	Strom	Widerstand	ThErstStrom	ThErstZeit	Magnis	Magnis	kHFactor	GrHFactor	LetzLänge	LetzQuerschnitt
ZVL	D	3	80	1.3	0	9	15	0	0	0	123.45	54.123
LS125	B	1	40	2	80	35..80	3	5	1.18	1.49		
LS125	B	1	50	1.7	100	35..100	3	5	1.18	1.49		
LS125	B	1	63	1.4	130	30..90	3	5	1.18	1.49		
LS125	B	1	80	1.1	160		3	5	1.18	1.49		
LS125	B	1	100	0.8	160		3	5	1.18	1.49		
LS125	B	1	125	0.7	160		3	5	1.18	1.49		
LS125	C	1	80	0.5	168	25..75	5	10	1.18	1.49		
LS125	C	1	100	0.75	220	50..100	5	10	1.18	1.49		
LS125	C	1	125	0.6	300	70..140	5	10	1.18	1.49		
LS125	D	1	80	0.9	168	25..75	10	20	1.18	1.49		
LS125	D	1	100	0.75	210	40..130	10	20	1.18	1.49		
LS125	D	1	125	0.6	160		10	16	1.18	1.49		
LS63	A	1	0.5	4000	0.9		2	3	1.18	1.49		
LS63	A	1	1	1995	1.8	(80..90)	2	3	1.18	1.49		
LS63	A	1	1.6	786	2.8	(80..90)	2	3	1.18	1.49		
LS63	A	1	2	510	3.6	(75..80)	2	3	1.18	1.49		
LS63	A	1	3	205	5.4	(70..80)	2	3	1.18	1.49		
LS63	A	1	4	134	7.5	(60..65)	2	3	1.18	1.49		

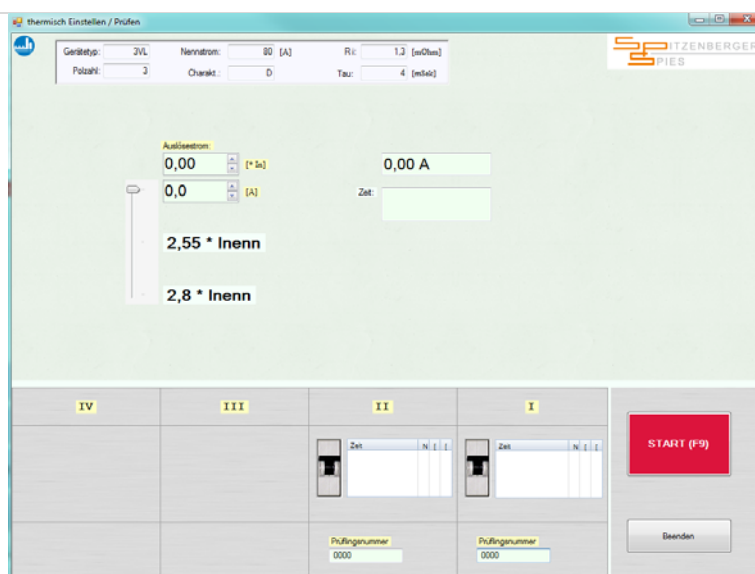
Database driven management of the EUT characteristics  
searching and filtering is possible

Test setup for magnetic tests with the parameters:

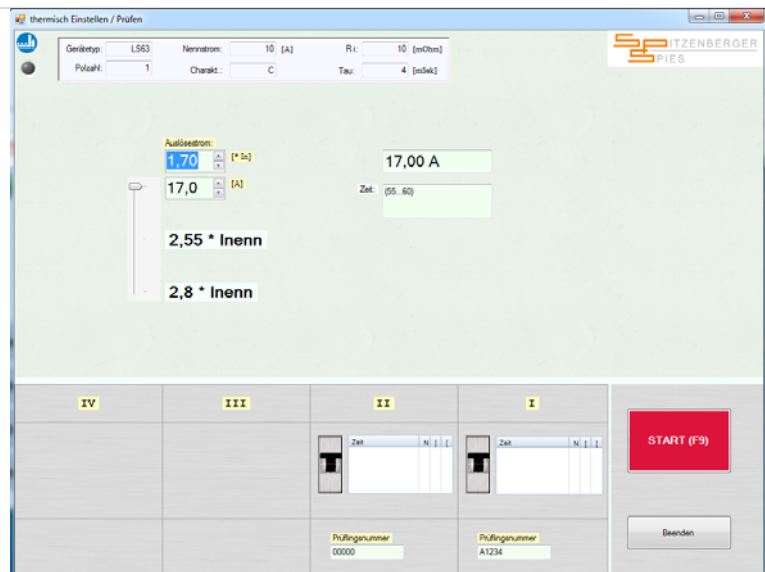
- hold current duration
- pause current duration
- tripping current duration



Approach of the magnetic tripping current:



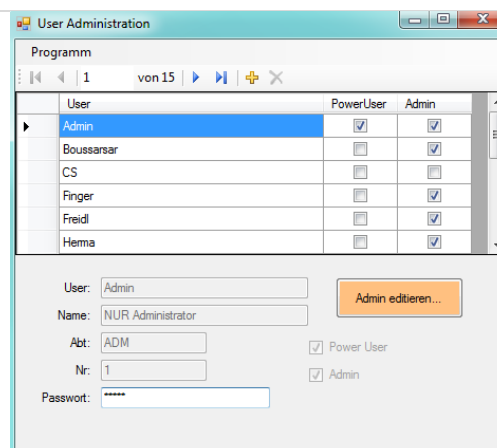
Testing the thermal characteristic:



Long-term testing:



Safety concept with integrated user management:



Screenshots show the German software version, English version is also available.

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SPS-PB-CircuitBreakerTestSystem-e-0001.docx





## MEASUREMENT AND CALCULATION OF THE TIME CONSTANT $\tau$ ACC. EN60898-2:

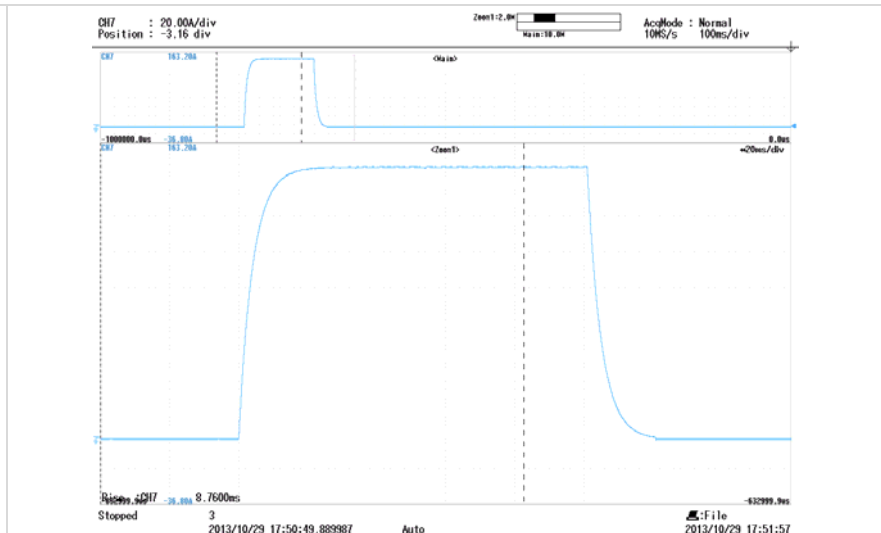
The requirements of the EN60898-2 relating to ripple are 100% according to the standard. The following oscilloscope measurements show the rise- and fall-times between 10% and 90% value of the output signal. The relating time constant can be calculated as follows:

Calculation:

$$\tau = \frac{\text{Risetime}}{\ln(9)}$$

$$\tau = \frac{8,7600ms}{\ln(9)}$$

$$\tau = \underline{\underline{3,987ms}}$$



Calculation:

$$\tau = \frac{\text{Risetime}}{\ln(9)}$$

$$\tau = \frac{8,7500ms}{\ln(9)}$$

$$\tau = \underline{\underline{3,982ms}}$$

